

density of spotted owls per km<sup>2</sup> in the five quadrats were 0.0708, 0.1007, 0.0794, 0.0563, and 0.0685, respectively. Eight owl territories were checked for reproduction. There was no reproduction for seven owl territories, and only one juvenile was fledged from the nesting pair. Habitat analysis was conducted on 13 roosting sites in 12 owl territories and one nest site. Mexican spotted owls roosting sites were characterized by pine-oak associations. Dominant tree species found at roosting sites were oaks (*Quercus* spp.), Mexican white pine (*Pinus ayacahuite*), Douglas fir (*Pseudotsuga menziesii*) and Arizona pine (*Pinus arizonica*). Dominant tree species at the nesting site was characterized by Mexican white pine and Arizona pine. Mexican spotted owl habitat in southwestern Chihuahua has become extensively fragmented due to forest exploitation.

#### SWAINSON'S HAWK SYMPOSIUM

##### PRODUCTIVITY, FOOD HABITS, AND BEHAVIOR OF SWAINSON'S HAWKS BREEDING IN SOUTHEAST COLORADO

ANDERSEN, D.E. *U.S. National Biological Survey, Minnesota Cooperative Fish and Wildlife Research Unit, Department of Fisheries and Wildlife, University of Minnesota, St. Paul, MN 55108 U.S.A.*

From 1984 through 1988, I studied Swainson's hawk (*Buteo swainsoni*) ecology during the breeding season on the Pinon Canyon Maneuver Site (PCMS) in southeast Colorado. The number of nesting attempts monitored annually ranged from a low of four in 1984, to a high of 22 in 1987. Nests used by Swainson's hawks were located in one-seed juniper (*Juniperus monosperma*) or cottonwood (*Populus* spp.) trees. Fractional nest success averaged 0.64 (SE = 0.341) and ranged from a low of 0.42 in 1985 to a high of 1.00 in 1984. Based on prey remains ( $N = 60$ ) collected at nest sites, food deliveries to nestlings consisted primarily of small birds (50%) and mammals (45%), and diet breadth ( $B = 2.65$ ) was low. Minimum convex polygon home range size of radio-marked adults during the post-fledging period averaged 21.2 km<sup>2</sup> ( $N = 4$ , SE = 10.0) in 1985 and 27.3 km<sup>2</sup> ( $N = 4$ , SE = 13.0) in 1986, with males exhibiting larger home ranges than females ( $P = 0.15$ ) across years. Compared with other breeding Swainson's hawk populations, birds on the PCMS exhibited high site reoccupancy among years, had large home ranges, and preyed heavily on ground-nesting birds.

##### HOME RANGE AND HABITAT ANALYSIS OF BREEDING SWAINSON'S HAWKS IN THE SACRAMENTO VALLEY OF CALIFORNIA

BABCOCK, K.W. *Michael Brandman Associates, 10423 Old Placerville Road, Suite 100, Sacramento, CA 95827 U.S.A.*

Until recently, very little was known about the breeding home range and foraging habitat requirements of the

Swainson's hawk (*Buteo swainsoni*) in the Sacramento Valley of California. And yet, this region is home to the highest concentration of Swainson's hawks in the state. In the Sacramento Valley, foraging ranges and total home range area are strongly influenced by current agricultural cropping patterns and cover-types. The mean home range size of five radio-marked breeding Swainson's hawks along the Sacramento River in 1992 was 40.9 km<sup>2</sup>. Core areas of intensive use by nesting Swainson's hawks ranged from 0.25–0.82 km<sup>2</sup>. Individual hawks foraged as far as 24 km from the nest area during foraging activities. During the radiotelemetry study, cover-types with less overall vegetative cover and greater prey availability (alfalfa, disced and fallow fields, dryland pasture, grain crops) ranked highest in foraging use. The use of crop and other cover-types were directly correlated with the amount of vegetation cover, prey availability, and farming activities such as harvesting, discing, mowing, and flood irrigating. The predominance of less suitable cover-types within the study area may explain the relatively large home ranges exhibited by the Swainson's hawks in this study.

##### CHANGES IN A NESTING POPULATION OF SWAINSON'S HAWKS IN THE LOS MEDANOS AREA, NEW MEXICO (1981–90)

BEDNARZ, J.C. *Department of Biological Sciences, Arkansas State University, State University, AR 72467 U.S.A.*  
T.J. HAYDEN. *Construction Engineering Lab, P.O. Box 9005, Champaign, IL 61826 U.S.A.*

Reproductive success of 238 Swainson's hawk (*Buteo swainsoni*) nests and the availability of some prey populations were monitored between 1981 and 1990 in the Los Medanos area of southeastern New Mexico. Mean clutch size declined significantly from 2.71 ( $N = 7$ ) in 1981 to 1.90 ( $N = 42$ ) in 1988 and 1989. Nest success dropped significantly from 100% ( $N = 11$ ) in 1982 to 39.1% ( $N = 23$ ) in 1988. Mean number of young fledged per nest decreased dramatically from 1.91 ( $N = 22$ ) in 1981–1982 to a low of 0.65 ( $N = 34$ ) in 1989. Measures of reproductive success improved slightly in 1990 but were not statistically different from the lows recorded in 1988 and 1989. Mean counts of desert cottontails (*Sylvilagus audubonii*) dropped precipitously from 11.9 per census in 1985 to 0.9 in 1988. Rodent numbers were lowest in 1986–87 and began increasing slowly thereafter. All measures of hawk reproductive performance were correlated ( $P < 0.05$ ) with mean numbers of lagomorphs counted on censuses; the strongest relationship was between clutch size and numbers of cottontails ( $r = 0.86$ ,  $P = 0.003$ ). Annual precipitation was not correlated with measures of available prey or hawk reproductive success. This analysis demonstrates that Swainson's hawk reproductive performance varies annually and is closely linked to numbers of available prey. Conservation of local Swainson's hawk populations may ultimately depend on metapopulation phe-